$$v = 0.5u(t) + 0.25u(t-d) + 0.15u(t-2d) + 0.1u(t-3d) \quad \text{... Equation 1}$$

In the Equation 1, K=4, "v" represents a coefficient to be sent to the quantization step width calculation circuit, "u(t)" represents a coefficient of the time "t" calculated by the coefficient calculation circuit, and "d" represents an interval of frames.

As explained above, in the second embodiment, the coefficient of the K number of previous frames is employed. Even in the case where the grouping can not desirably be achieved, the failure of the grouping has only a slight influence on the outcome image.

An image encoder according to the third embodiment of the present invention will now be described.

In the image encoder 10 according to the first embodiment of the present invention, the weighting coefficient is calculated by the weighting coefficient calculation circuit based on a result of grouping done by the motion-vector-based block grouping section 22, if the motion vector is detected. On the contrary, the weighting coefficient is calculated by the weighting coefficient calculation circuit based on a result of grouping done by the DC-component-based block grouping section 26, if the motion vector is not detected.

In the image encoder according to the third embodiment of the present invention, the weighting coefficient calculation circuit 27 obtains a product of a weighting coefficient calculated based on a result of grouping done by the motion-vector-based block grouping section 22 and a weighting coefficient calculated based on a result of grouping done by the DC-component-based block grouping section 26. Then, the weighting coefficient calculation circuit 27 provides the quantization step width calculation circuit 28 with the obtained product.

The image encoder according to the third embodiment of the present invention can transmit the important portion of an input image in a high degree of preciseness, by extracting the important portion using DC components, even in the case where it is hard to extract the important portion only based on the motion vector, for example, in the case where there is motion only in a portion of the background image and no motion is found

in the important portion of the input image.

Like the input image shown in FIGS. 6A and 6B, in the case where two persons' images have similar motion, the image encoder according to the third embodiment can transmit the image data, focusing on only one person staying right in front of the camera based on a result of grouping done based on DC components, during the movement of the two persons.

In the case where the camera is moving around while the persons or background image do not have any motion, each portion of the input image has motion in a similar manner to other portions. Hence, the image encoder can not identify each portion of the input image only by grouping the blocks based on the motion vector. The image encoder groups the blocks of the input image, suitably based on the motion vector in combination with the DC components of the color information and brightness of each portion included in the input image. This enables to transmit the important portion of the input image in a high degree of preciseness.

Accordingly, the image encoder employing the structure of the present invention detects the motion vector of each of the plurality of blocks forming a single frame, arranges the blocks into groups based on the detected motion vector, and calculates a weighting coefficient for each group of blocks. In the case where the motion vector can not be detected, the image encoder of the present invention arranges the blocks into groups based on the DC components of the brightness and color information of each block, calculates a weighting coefficient for each group of blocks, and extracts the important portion of the input image. In such circumstances, the image encoder assigns a small quantization step to the important person's image in the input image and a large quantization step width to the background image, etc. which is not so important in the input image, and hence transmitting high quality image suitable for the TV conference system or TV telephone system. Even in the case where the input image does not have motion, the input image is divided into portions based on the color information and

brightness so that the high quality image of the important portion of the input image can be transmitted.

The motion vector of each target block is compared with a block included in a previously-input frame, thereby enabling to detect each motion vector with high accuracy.

The calculation of the weighting coefficient of each group is done based on the motion vector, in accordance with the number of blocks included in the group, so as to obtain the weighting coefficient with high accuracy.

The calculation of the weighting coefficient of each group is done based on the DC components, in accordance with the distance between the center of the block and the center of the frame, so as to obtain the weighting coefficient with high accuracy.

Further, the weighting coefficient is re-calculated using the plurality of previous weighting coefficients. Thus, even the grouping is not adequately performed, if the weighting coefficients of an K number of previous frames are employed, no serious problems should occur.

The image encoder of the present invention detects the motion vector of each of the plurality of blocks which constitute the input image frame, arranges the blocks into groups based on the detected motion vector and calculates a weighting coefficient of each group of blocks. Further, the image encoder arranges the blocks into groups based on the DC components of each block and calculates a weighting coefficient of each group. Subsequently, the image encoder calculates a product of the weighting coefficient of each group of blocks arranged based on the motion vector and the weighting coefficient of each group of blocks arranged based on the DC components, and extracts the important portion of the input image. Thus, even in the case where it is difficult to extract the important portion of the input image based only on the motion vector, for example in the case where there is motion only in one portion of the background image or the entire portions of the input image are similarly moving, the important portion of the input image is extracted using an extraction technique employing DC components so as to be